



AFCTN Test Report 94-048

AFCTB-ID
93-099

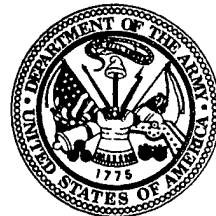


Technical IGES Graphics Transfer

Using:



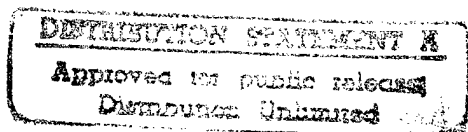
IBM SID Boulder's Data



MIL-D-28000A (IGES)



Quick Short Test Report



15 October 1993

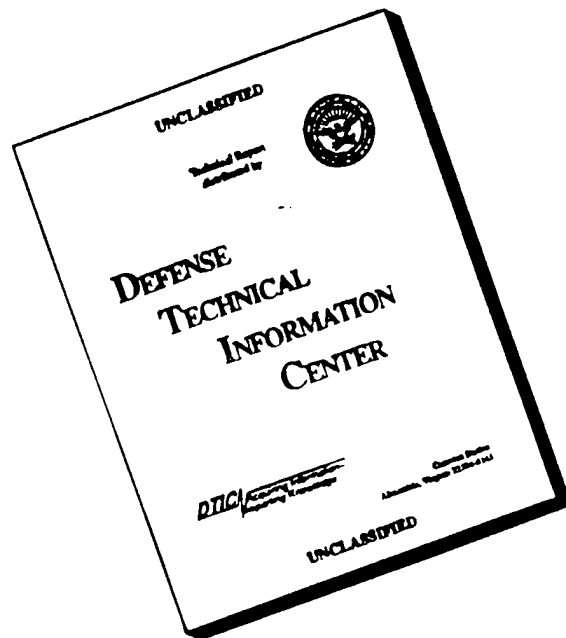
19960822 179



Prepared For:
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Quick Short Test Report

15 October 1993

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Contents

1.	Introduction.....	1
1.1.	Background.....	1
1.2.	Purpose.....	2
2.	Test Parameters.....	3
3.	1840A Analysis.....	5
3.1.	External Packaging.....	5
3.2.	Transmission Envelope.....	5
3.2.1.	Tape Formats.....	5
3.2.2.	Declaration and Header Fields.....	6
4.	IGES Analysis.....	6
5.	SGML Analysis.....	8
6.	Raster Analysis.....	8
7.	CGM Analysis.....	8
8.	Conclusions and Recommendations.....	9
9.	Appendix A - Tapetool Report Logs.....	10
9.1.	Tape Catalog.....	10
9.2.	Tape Evaluation Log.....	11
9.3.	Tape File Set Validation Log.....	13
10.	Appendix B - IGES Detailed Analysis.....	15
10.1.	File D001Q009.....	15
10.1.1.	Parser/Verifier Log.....	15
10.1.2.	Parser Log - AutoCAD R12.....	20

10.1.3. Output AutoCAD R12.....	24
10.1.4. Output Cadkey v6.00.....	25
10.1.5. Output Cadleaf.....	26
10.1.6. Output IGESView.....	27
10.1.7. Output IGESWorks.....	28
10.1.8. Output Preview.....	29

1. Introduction

1.1 Background

The Department of Defense (DoD) Air Force Continuous Acquisition and Life-cycle Support (CALS) Test Network (AFCTN) is conducting tests of the military standard for the Automated Interchange of Technical Information, MIL-STD-1840A, and its companion suite of military specifications. The AFCTN is a DoD sponsored confederation of voluntary participants from industry and government managed by the Electronic Systems Center (ESC).

The primary objective of the AFCTN is to evaluate the effectiveness of the CALS standards for technical data interchange and to demonstrate the technical capabilities and operational suitability of those standards. Two general categories of tests are performed to evaluate the standards; formal and informal.

Formal tests are large and comprehensive, which follow a written test plan, require specific authorization from the DoD, and may take months to prepare, execute, and report.

Informal tests are quick and short, used by the AFCTN technical staff, to broaden the testing base. They include representative samples of the many systems and applications used by AFCTN participants. They also allow the AFCTN staff to gain feedback from many industry and government interpretations of the standards, to increase the base of participation in the CALS initiative, and respond to the many requests for help that come from participants. Participants take part voluntarily, benefit by receiving an evaluation of their latest implementation (interpretation) of the standards, interact with the AFCTN technical staff, gain experience using the standards, and develop increased confidence in them. The results of informal tests are reported in Quick Short Test Reports (QSTRs) that briefly summarize the standard(s) tested, the hardware and software used, the nature of the test, and the results.

1.2 Purpose

The purpose of the informal test, reported in this QSTR, was to analyze IBM SID Boulder's interpretation and use of the CALS standards, in transferring technical IGES Graphics data. IBM used its CALS Technical Data Interchange System to produce data, in accordance with the standards, and delivered it to the AFCTN technical staff on a 9-track magnetic tape.

2. Test Parameters

Test Plan: AFCTB 93-099

**Date of
Evaluation:** 15 October 1993

Evaluator: George Elwood
Air Force CALS Test Bed
Det 2 HQ ESC/AV-2P
4027 Colonel Glenn Hwy
Suite 300
Dayton OH 45431-1672

**Data
Originator:** Ina Dickenson
IBM
685 Citadel Drive East
Colorado Springs CO 80909

**Data
Description:** Technical Manual Test
1 Document Declaration file
10 Initial Graphics Exchange Specification
(IGES) files

**Data
Source System:**

1840

HARDWARE

Unknown

SOFTWARE

Unknown

IGES

HARDWARE

Unknown

SOFTWARE

CADAM MDA030 V2R1M1

Evaluation Tools Used:

MIL-STD-1840A (TAPE)

SUN 3/280

AFCTN Tapetool v1.2.10 UNIX

PC 486/50

AFCTN Tapetool v1.2.10 DOS

MIL-D-28000 (IGES)

Sun SparcStation 2

AUTODESK AutoCAD R12

Carberry CADLeaf Plus v3.1

IGES Data Analysis (IDA) Parser/Verifier v92

IDA IGESView v3.05

Intergraph I/EMS v02.00.01.11

Intergraph I/CIGES v02.00.01.03

International TechneGroup Incorporated

(ITI) IGES/Works v1.3

Rosetta Technologies Prepare

Rosetta Technologies Preview v3.2

PC 486/50

AUTODESK AutoCAD 386 R12

Cadkey Cadkey v6.0

IDA IGES Parser/Verifier v92

IDA IGESView Windows

Wiz Worx IGESPeek

Standards

Tested:

MIL-STD-1840A

MIL-D-28000A

3. 1840A Analysis

3.1 External Packaging

The tape arrived at the Air Force CALS Test Bed (AFCTB) enclosed in a box in accordance with ASTM D 3951. The exterior of the box was marked with a magnetic tape warning label, as required by MIL-STD-1840A, para. 5.3.1.3.

The tape was enclosed in barrier sheet material as required by MIL-STD-1840A, para. 5.3.1.2. The tape reel was missing the label indicating the recording density, as required by MIL-STD-1840A, para. 5.3.1. Some 9-track tape units require this BPI to be set manually. A packing list showing all files recorded on the tape was not enclosed in the box.

3.2 Transmission Envelope

The 9-track tape received by the AFCTB contained MIL-STD-1840A files. The files were named per the standard conventions.

3.2.1 Tape Formats

The tape was run through the AFCTN *Tapetool v1.2.10* utility. One system I/O error and one note were encountered while evaluating the contents of the tape labels. The error was reported in the D001 file. A visual inspection of the file showed that no data was lost.

```
*** I/O ERROR - Invalid Record Control Word encountered.  
    Record Control Word contained an invalid record length.  
    Record Control Word string =>  
*** NOTE - Remainder of file will be skipped.
```

Although one error was reported no data was lost. For this reason the tape's physical structure meets the requirements defined in CALS MIL-STD-1840A.

3.2.2 Declaration and Header Fields

No errors were found in the Document Declaration file or data file headers. This portion of the tape meets the requirements in CALS MIL-STD-1840A.

4. IGES Analysis

The tape contained 10 IGES files. These files were evaluated using IDA's *parser/verifier* set for CALS Class I. No CALS errors were reported in any of the files.

The files were checked for the required conformance statement defined in MIL-D-28000A. The statement was found in all files.

The AFCTB has several tools for viewing IGES files. These tools are not used to generate a pass/fail but to report how commercially available software can handle the files. Many of these products are used in the development of technical publications and are good indicators of usability. The use of these products is not an endorsement nor an indication of CALS capability. All operations were performed using the default settings.

An attempt to convert the files, using a utility available within the AFCTB, resulted in an error message indicating the files were not valid ASCII IGES files.

The files were read using AUTODESK's *AutoCAD R12* with translator version 5.1. All ten files translated without a problem. The resulting files were viewed and file D001Q009 was printed as a sample.

The files were read into another software package, available within the AFCTB, without a reported error. When file D001Q009 was viewed, only half the text was displayed. The text in the blocks on the right side of the screen were displayed while the left side did not have any text.

The files were converted using Cadkey's *ig2c* utility without a reported error. The resulting files were read into Cadkey's *Cadkey* and displayed. File D001Q009 was printed as a sample.

The files were read into Carberry's *CADLeaf* software without a reported error. The images appeared to be complete and file D001Q009 was printed as a sample.

The files were read using IDA's *IGESView* and *IGESView for Windows* without a reported error. File D001Q009 was printed as a sample.

The IGES files were converted using Intergraph's *I/CIGES* utility without a reported error. The resulting files were read into *I/EMS* and displayed.

The files were read using ITI's *IGESWorks* without a reported error. All files were displayed and file D001Q009 was printed.

The IGES files were converted using Rosetta Technologies' *Prepare* without a reported error. The resulting files were read into Rosetta Technologies' *Preview*, displayed and file D001Q009 was printed.

An attempt to read the files into the *Wiz Worx ig2jet* utility was made. Because the files were structured without carriage returns and line feed this program could not read the files. It reported that it could not find the terminate section.

The IGES files on the tape meet the CALS MIL-D-28000A specification.

5. SGML Analysis

No Standard Generalized Markup Language (SGML) files were included on this tape.

6. Raster Analysis

No Raster files were included on this tape.

7. CGM Analysis

No Computer Graphic Metafile (CGM) files were included on this tape.

8. Conclusions and Recommendations

The MIL-STD-1840A tape from IBM SID Boulder was correct. The tape was read properly using the AFCTN *Tapetool* software with one reported system I/O error, which did not cause any data loss.

The tape contained ten IGES files. All files were reported without CALS errors. The files were read into most of the software tools available in the AFCTB, and meet the CALS MIL-D-28000A specification.

The tape meets the CALS MIL-STD-1840A requirements.

9. Appendix A - Tapetool Report Logs

9.1 Tape Catalog

CALS Test Network Catalog Evaluation - Version 1.2; Release 10 (C)

Standards referenced:

MIL-STD-1840A (1987) - Automated Interchange of Technical Information

ANSI X3.27 (1987) - File Structure and labeling of Magnetic Tapes
for Information Interchange

ANSI X3.4 (1986) - Coded Character Sets - 7 Bit ASCII

Wed Oct 13 07:54:53 1993

MIL-STD-1840A File Catalog

File Set Directory: /cals/u1210/Set026

Page: 1

File Name Extracted	File Type	Record Format/ Selected/ Length	Block Length/Total
D001 Selected	Document Declaration	D/00260	02048/000001
D001Q001 Extracted	IGES	F/00080	02000/000064
D001Q002 Extracted	IGES	F/00080	02000/000223
D001Q003 Extracted	IGES	F/00080	02000/000044
D001Q004 Extracted	IGES	F/00080	02000/000242
D001Q005 Extracted	IGES	F/00080	02000/000022
D001Q006 Extracted	IGES	F/00080	02000/000177
D001Q007 Extracted	IGES	F/00080	02000/000049
D001Q008 Extracted	IGES	F/00080	02000/000083
D001Q009 Extracted	IGES	F/00080	02000/000293
D001Q010 Extracted	IGES	F/00080	02000/000023

Catalog Process terminated normally.

9.2 Tape Evaluation Log

CALS Test Network Tape Evaluation - Version 1.2; Release 10 (C)

Standards referenced:

ANSI X3.27 (1987) - File Structure and labeling of Magnetic Tapes
for Information Interchange

ANSI X3.4 (1986) - Coded Character Sets - 7 Bit ASCII

Wed Oct 13 07:53:58 1993

ANSI Tape Import Log

Allocating tape drive /dev/rmt0...

/dev/rmt0 allocated.

VOL1CALS01

SCBERT

4

Label Identifier: VOL1
Volume Identifier: CALS01
Volume Accessibility:
Owner Identifier: SCBERT
Label Standard Version: 4

HDR1D001

CALS0100010001000100 93280 93280 000000

Label Identifier: HDR1
File Identifier: D001
File Set Identifier: CALS01
File Section Number: 0001
File Sequence Number: 0001
Generation Number: 0001
Generation Version Number: 00
Creation Date: 93280
Expiration Date: 93280
File Accessibility:
Block Count: 000000
Implementation Identifier:

HDR2D0204800260

00

Label Identifier: HDR2
Recording Format: D
Block Length: 02048
Record Length: 00260
Offset Length: 00

***** Tape Mark *****

Actual Block Size Found = 2048 Bytes.

*** I/O ERROR - Invalid Record Control Word encountered.
Record Control Word contained an invalid record length.
Record Control Word string =>

*** NOTE - Remainder of file will be skipped.

Number of data blocks read = 1.

***** Tape Mark *****

EOF1D001 CALS0100010001000100 93280 93280 000001

Label Identifier: EOF1
File Identifier: D001
File Set Identifier: CALS01
File Section Number: 0001
File Sequence Number: 0001
Generation Number: 0001
Generation Version Number: 00
Creation Date: 93280
Expiration Date: 93280
File Accessibility:
Block Count: 000001
Implementation Identifier:

<<<< PART OF LOG FILE REMOVED HERE >>>>

***** Tape Mark *****

End of Volume CALS01

End Of Tape File Set

Deallocating /dev/rmt0...

Tape Import Process terminated with 1 error(s), 0 warning(s),
and 1 note(s).

9.3 Tape File Set Validation Log

CALS Test Network File Set Evaluation - Version 1.2; Release 10 (C)

Standards referenced:

MIL-STD-1840A (1987) - Automated Interchange of Technical Information

Wed Oct 13 07:54:53 1993

MIL-STD-1840A File Set Evaluation Log

File Set: Set026

Found file: D001

Extracting Document Declaration Header Records...

Evaluating Document Declaration Header Records...

srcsys: 256

srcdocid: IENTITY

srcrelid: LGTABLE

chglvl: A, 0, 19891031

dteis: 19891031

dstsys: ctn members

dstdocid: IENTITY

dstrelid: LGTABLE

dtetrm: 19931007

dlvacc: IGES data

filcnt: Q10

ttlcls: Unclassified

doccls: Unclassified

doctyp: CTN MIL-D-28000 Class I Reference Illustration

docttl: IENTITY Reference Illustration

Found file: D001Q001

Extracting IGES Header Records...

Evaluating IGES Header Records...

srcdocid: IENTITY

dstdocid: IENTITY

txtfilid: NONE

figid: None

srcgph: NONE

doccls: Unclassified

notes: The first line of the IGES file begins next

Saving IGES Header File: D001Q001_HDR

Saving IGES Data File: D001Q001_IGS

<<<<< PART OF LOG FILE REMOVED HERE >>>>>

Found file: D001Q010
Extracting IGES Header Records...
Evaluating IGES Header Records...

srcdocid: IENTITY
dstdocid: IENTITY
txtfilid: NONE
figid: None
srcgph: NONE
doccls: Unclassified
notes: The first line of the IGES file begins next

Saving IGES Header File: D001Q010_HDR
Saving IGES Data File: D001Q010_IGS

Evaluating numbering scheme...
No errors were encountered during numbering scheme evaluation.
Numbering scheme evaluation complete.

Checking file count...
No errors were encountered during file count verification.
File Count verification complete.

No errors were encountered in Document D001.

No errors were encountered in this File Set.

MIL-STD-1840A File Set Evaluation Complete.

10. Appendix B - Detailed IGES Analysis

10.1 File D001Q009

10.1.1 Parser/Verifier Log

```
*****
*****  IGES PARSER/VERIFIER  *****
*****      MARCH 1993      *****
*****  IGES Data Analysis  *****
*****    (708) 344-1815    *****
*****
```

Input file is /mnt/u1210/Set026/D001/D001Q009_IGS
Checking conformance to CALS Class I (MIL-D-28000A 2/10/92)
Today is October 13, 1993 8:35 AM

```
*****
*****  CHECK FILE SYNTAX  *****
*****
```

Section	Records
Start	8
Global	4
Directory	3874 (1937 Entities)
Parameter	3417
Terminate	1

NITPICK 2489: Excess precision in real constant (0.20833333) for LineWidth of Global Section.

NITPICK 2489: Excess precision in real constant (-52.2481842) for P1.X of D 1.

NITPICK 2489: Messages regarding excess precision suppressed.

```
*****
*****  SUMMARY AND STATISTICS  ****
*****
```

*** File and Product Name Information ***

```
File name from sender   = 'CP205C-B-##F003#####'
File creation Date.Time = '930903.120111'
Model change Date.Time  = ''
Author                  = ''
```

Department = 'IBM SID BOULDER'
Product name from sender = 'FIG. 3 SDTL EQUIPMENT CONFIGURATION
TRNDTC1512 '
Destination product name = ''

*** Parameter Delimiters ***

Delimiter = ','
Terminator = ';'

*** Originating System Data ***

System ID = 'IBM CADAM MDA030'
Preprocessor version = 'V2R1M1'
Specification version = 6 (IGES 4.0)

*** Precision levels ***

Integer bits = 32
Floating point - Exponent = 75 Mantissa = 6
Double precision - Exponent = 75 Mantissa = 15

*** Global Model Data ***

Model scale = 1.0000E+00
Unit flag = 4
Units = 'FT'
Line weights = 208
Maximum line thickness = 2.083333E-01
Minimum line thickness = 1.001603E-03
Granularity = 1.000000E-03
Maximum coordinate = 0.000000E+00

CAUTION 2316: Maximum intended coordinate value of 0.000000E+00 will be
defaulted to zero.

Drafting standard applicable to original data is not specified.

*** Status Flag Summary ***

Blank status:	Visible	1937
	Blanked	0
Independence:	Independent	1936
	Physically Subordinate	0
	Logically Subordinate	1
	Totally Subordinate	0
Entity use:	Geometry	1429
	Annotation	508

Definition	0
Other	0
Logical/Positional	0
2D parametric	0
Construction geometry	0
Not Specified	0

Hierarchy:	Structure DE applies	1936
	Subordinate DE applies	1
	Hierarchy property applies	0
	Not Specified	0

*** Entity Occurrence Counts ***

Entity	Form	Level	Count	Type
-----	----	-----	-----	-----
100	0	0	76	Circular arc
104	1	0	46	Conic arc - ellipse
106	11	0	630	Copious data - Piecewise planar, linear string(2D linear path)
110	0	0	612	Line
112	0	0	18	Parametric spline curve
124	0	0	46	Transformation matrix
212	0	0	506	General note
404	0	0	1	Drawing
406	16	0	1	Property - Drawing size
410	0	0	1	View - Orthographic parallel

*** Entity Count by Level ***

Level	Count
0	1937

*** Labeling Information ***

0% of the entities are labeled.

Unlabeled 1937

*** Line Fonts Used in Data ***

100	102	104	106	108	110	112	114	
-	-	-	-	-	-	-	-	Undefined
76	-	46	630	-	586	18	-	Solid
-	-	-	-	-	22	-	-	Dashed
-	-	-	-	-	4	-	-	Phantom

-	-	-	-	-	-	-	-	Center-line
-	-	-	-	-	-	-	-	Dotted
-	-	-	-	-	-	-	-	User defined

116 118 120 122 124 125 126 128

-	-	-	-	46	-	-	-	Undefined
---	---	---	---	----	---	---	---	-----------

<<<< PART OF LOG FILE REMOVED HERE >>>>

*** Line Widths Used in Data ***

Weight	Count	Width
Defaulted	1937	(0.0010)

*** Colors Used in Data ***

Defaulted 1937

***** ENTITY ANALYSIS *****

*** Entity type: 100

*** Entity type: 104

*** Entity type: 106

*** Entity type: 110

-- 612 lines averaging 2.851160E+00 units --

*** Entity type: 112

*** Entity type: 124

WARNING 2492: Undefined line font value (0) specified for D 2835.

WARNING 2492: Messages regarding undefined line font suppressed.

46 transformation matrices, 46 non-zero translations.

NOTE 2341: 46 matrices contain translation information.

*** Entity type: 212

506 text strings in data file.

Average text aspect ratio in file is 0.8664842.

Minimum text aspect ratio in file is 0.6666663.

Maximum text aspect ratio in file is 0.9926740.

FONTS USED IN FILE

FONT	COUNT	NAME
1	506	Default ASCII Style

*** Entity type: 404

Drawing at D 3871 contains 1 views.

NITPICK 2289: View (D 3873) is not logically subordinate to drawing at D 3871.

Drawing at D 3871 contains 0 annotation entities.

*** Entity type: 406

*** Entity type: 410

NITPICK 2332: View referenced by drawing (D 3871) is not subordinate at D 3873.

Scale of view at D 3873 is 1.000000E+00.

Orthographic View entity at D 3873 has 0 clipping planes specified.

XMIN = Not Set	XMAX = Not Set
YMIN = Not Set	YMAX = Not Set
ZMIN = Not Set	ZMAX = Not Set

*** Message Summary ***

2011: 1 Invalid subordinate relationships.

2038: 49 Invalid Line font values.

*** Error Summary ***

0 fatal errors
0 severe errors
0 errors 49 warnings 1 cautions 10191 nitpicks 1 notes

*** End of Analysis of /mnt/u1210/Set026/D001/D001Q009_IGS ***

10.1.2 Parser Log - AutoCAD R12

Title: IGESIN Journal (v5.1 Nov 05 1992)

=====

File: C:/9399/Q009.xli

Date: Fri, Oct 15, 1993

Time: 13:22:19

=====

EVALUATION VERSION -- NOT FOR RESALE

Translator S/N: 117-10075750

Translating from IGES file: C:/9399/Q009.IGS

to AutoCAD Drawing: C:\9399\Q009.dwg

=====

Options obtained from: C:\ACAD\SUPPORT\CALS1.OPT

Options Description: Configuration file for CALS Class I

Curves Approximated to Tolerance of 0.01

Surfaces Approximated to Tolerance of 0.01

Text Font/Style mapping:

IGES Text font	Style Name	ACAD Font
0	SYMBOL0	iges0
1	STANDARD	txt
2	LEROY	txt
3	FUTURA	txt
6	COMP80	txt
12	GOTHICE	gothice
13	GOTHICI	gothici
14	ROMANS	romans
17	ROMANT	romant
18	ROMAND	romand
19	OCR	txt
1001	SYMBOL1	iges1001
1002	SYMBOL2	iges1002
1003	SYMBOL3	iges1003
2001	KANJI	bigfont

IGES Linefont/AutoCAD Linetype mapping

IGES Line Font	AutoCAD linetype	Shape file
0	BYLAYER	
1	CONTINUOUS	
2	DASHED	acad.lin
3	PHANTOM	acad.lin
4	CENTER	acad.lin

5

DOT

acad.lin

=====

Parse phase

*** Warning (IAFP_LARGER_SGL_EXP) ***

C:/9399/Q009.IGS, line 12: IGES file contains numbers with a larger single precision exponent than what is allowed on this system.

*** Warning (IEVM_BAD_CONTINUITY_112) ***

(DE 2537, TF 112:0) Entity's Degree of Continuity, 1, is incorrectly specified.

Degree of Continuity calculated to be 2.

Action taken: Degree of Continuity set to 2.

<<<<< PART OF LOG FILE REMOVED HERE >>>>>

=====

Start Section:

CONFORMS TO MIL SPEC. 28000 CLASS 1 CREATED:Tue Sep 21 13:38:56 1993
THIS IS A SAMPLE INPUT FILE FOR IBM IGES PROCESSOR
VERSION 2 RELEASE 3 MODIFICATION 0 (5688-047)

SEE IGES PROCESSOR PROGRAMMERS' REFERENCE AND OPERATIONS
MANUAL FOR THE DESCRIPTION OF USER OPTIONS

Global Section:

Parameter Delimiter: ,
Record Delimiter: ;
Sending Product ID: FIG. 3 SDTL EQUIPMENT CONFIGURATION
 TRNDTC1512
File Name: CP205C-B-##F003#####
System ID: IBM CADAM MDA030
Preprocessor Version: V2R1M1
Size of Integer: 32
Sgl. Precision Mag: 75
Sgl. Precision Sig: 6
Dbl. Precision Mag: 75
Dbl. Precision Sig: 15
Receiving Product ID:
Model Space Scale: 1.000000
Unit Flag: 4
Unit String: FT
of Line Weights: 208

Maximum Line Width: 0.208333
 Creation Date: 09/03/93 12:01:11
 Minimum Resolution: 0.001000
 Maximum Coordinate: 0.000000
 Author:
 Organization: IBM SID BOULDER
 IGES Version Number: 6
 Drafting Standard: 0

Entity Summary:

Type	Form	Description	Count
100	0	Circular Arc	76
104	1	Ellipse	46
106	11	Planar Piecewise Linear Curve	630
110	0	Line	612
112	0	Parametric Spline Curve	18
124	0	Transformation Matrix	46
212	0	General Note (Simple)	506
404	0	Drawing (form 0)	1
406	16	Property (Drawing Size)	1
410	0	View	1
Total			1937

Translation phase

Drawing Entity (404 Form 0) at DE 3871, with

name = ,
 size = 0.000000, 44.000000,
 units = FT,

was processed in the AutoCAD drawing file: C:\9399\Q009.dwg

*** Warning (ACAD_NEW_VIEW_VOLUME_GENERATED) ***

(DE: 3873 TF: 410:0)

A new view volume has been generated for the view with:

XMIN (-71.343171), XMAX (7.593171),
 YMIN (-8.218171), YMAX (48.218171),
 ZMIN (-7.593171), ZMAX (7.593171).

IGES Entity Summary

Type	Form	Description	Count	Processed	Errors
100	0	Circular Arc	76	76	0
104	1	Ellipse	46	46	0

106	11 Planar Piecewise Linear Curve	630	630	0
110	0 Line	612	612	0
112	0 Parametric Spline Curve	18	18	0
212	0 General Note (Simple)	506	506	0
404	0 Drawing (form 0)	1	1	0
406	16 Property (Drawing Size)	1	1	0
410	0 View	1	1	0
		=====	=====	=====
Totals		1891	1891	0

AutoCAD Entity Summary

Entity	Created	Errors
=====	=====	=====
LINE	612	0
CIRCLE	16	0
TEXT	506	0
ARC	60	0
POLYLINE	694	0
Totals	=====	=====
	1888	0

Error Summary:

The following message was issued 1 time(s)
IGES file contains numbers with a larger single precision exponent than what is allowed on this system.

The following message was issued 5 time(s)
Entity's Degree of Continuity, %d, is incorrectly specified. Degree of Continuity calculated to be %d.

The following message was issued 1 time(s)
A new view volume has been generated for the view with:
XMIN (%lf), XMAX (%lf),
YMIN (%lf), YMAX (%lf),
ZMIN (%lf), ZMAX (%lf).

Status: 0
Warning: 7
Error: 0
Fatal: 0

Elapsed Time:
Processor: 00:01:10
Clock: 00:01:10

10.1.3 Output AutoCAD R12

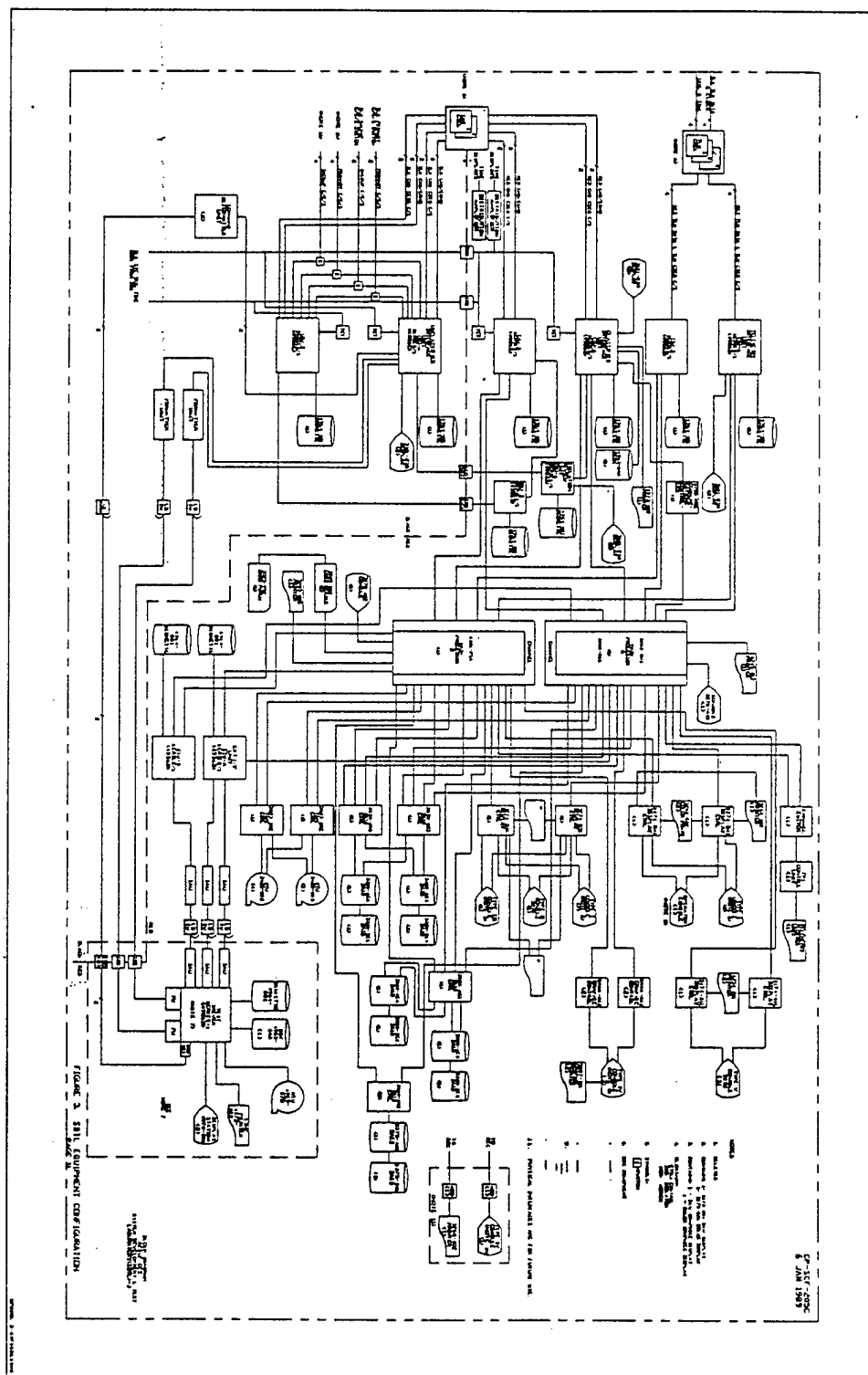
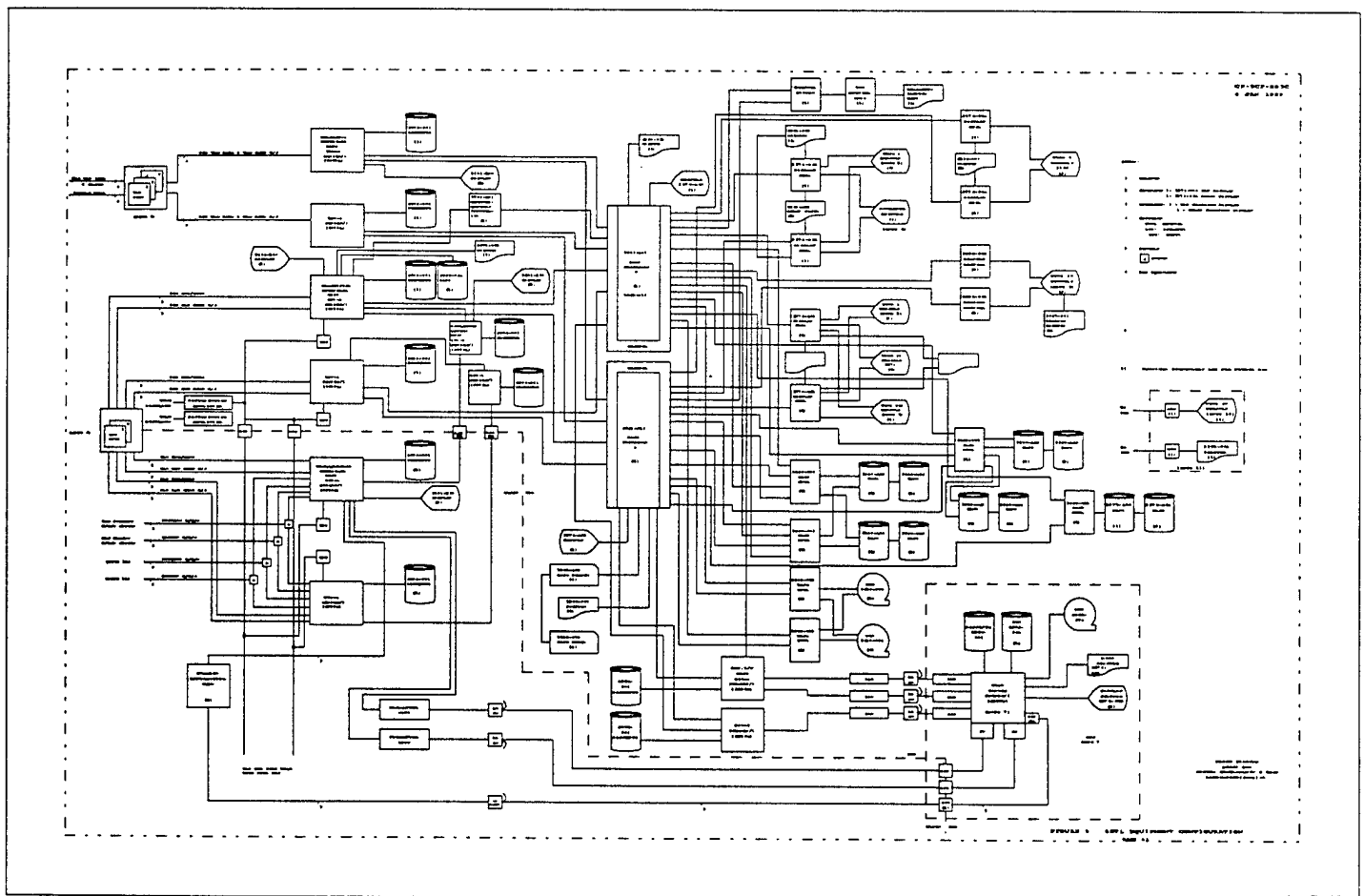
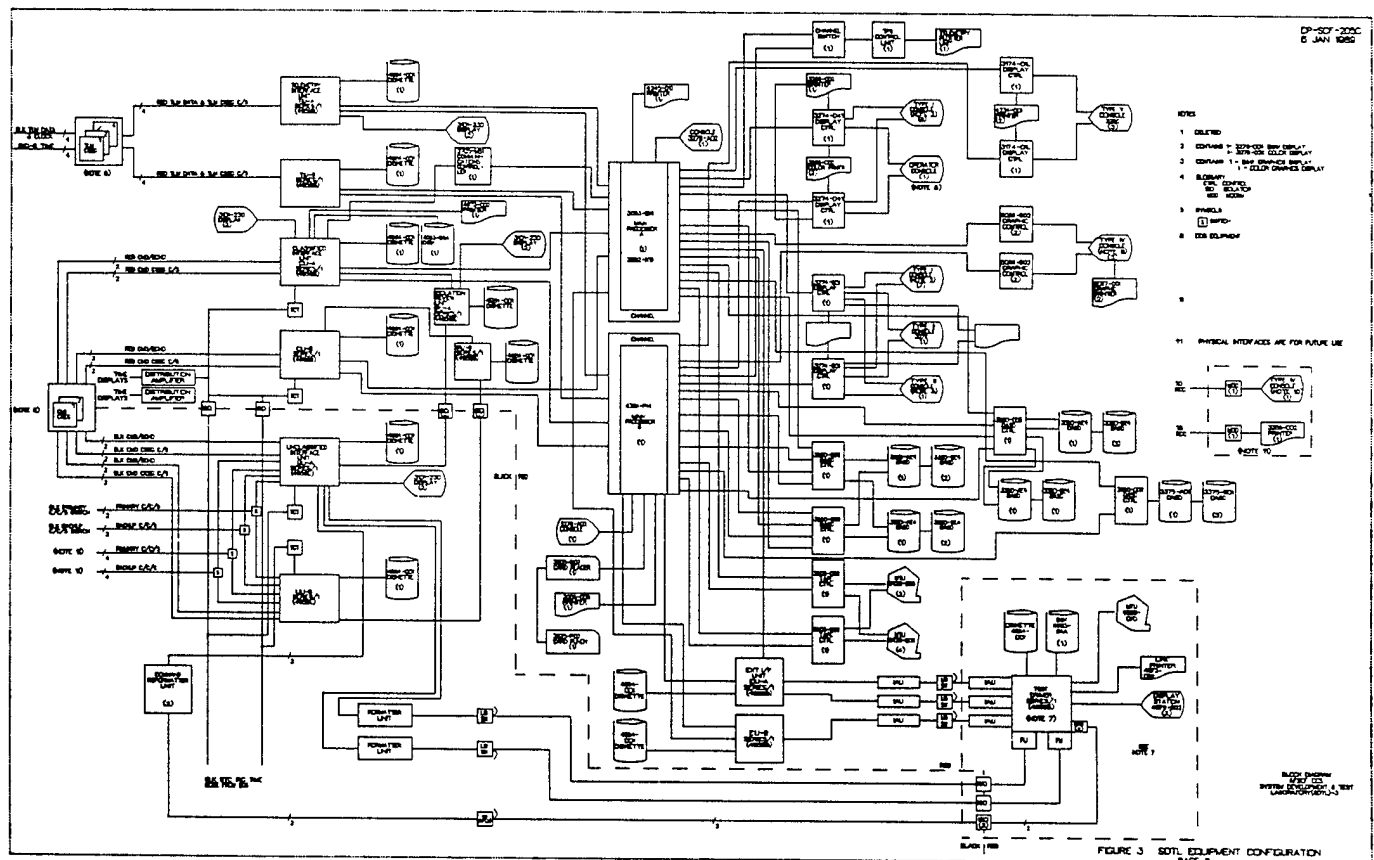


FIGURE 2. DTL EQUIPMENT CONFIGURATION

10.1.5 Output Cadleaf



10.1.6 Output IGESView



10.1.7 Output IGESWorks

